



THE UNIVERSITY OF GEORGIA

COOPERATIVE EXTENSION

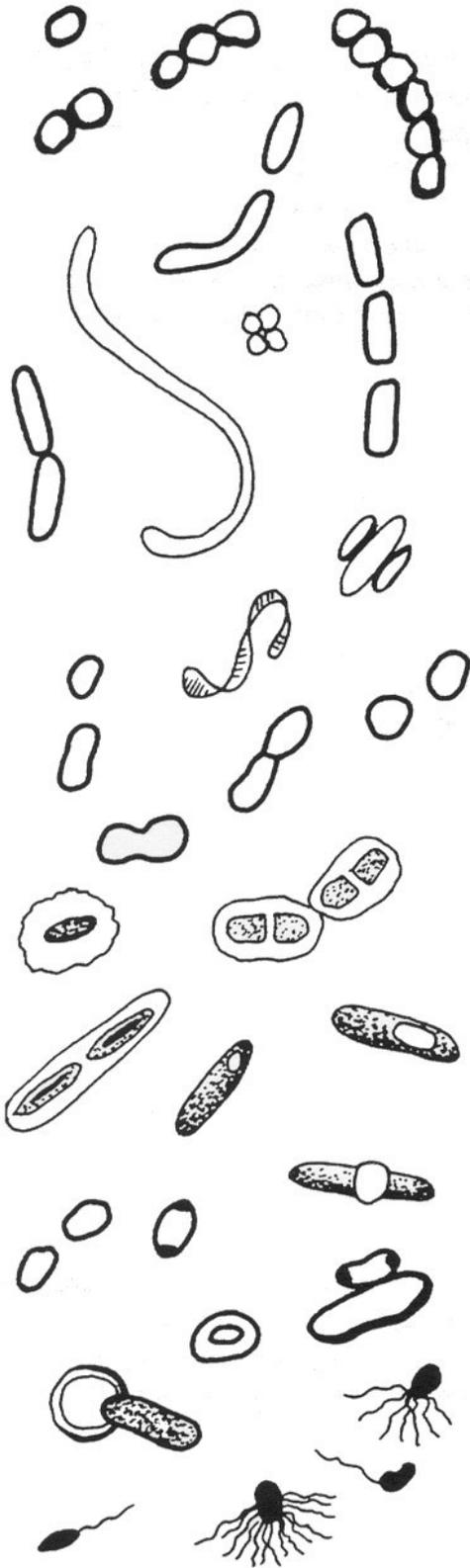
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FOOD, HANDS and BACTERIA

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Stop the Population Explosion: WASH YOUR HANDS!



Bacteria have exploding populations, and can reproduce every 20 minutes. There are so many bacteria that you have more of them on your body right now than there are people in the United States.

Bacteria may be good or bad, depending on what they do *to* you or *for* you, and they are here to stay. We can't always get rid of them, so we must learn to live with them.

Some bacteria spend their lives in the small folds of the skin, on hair or under fingernails. Others cause body odor. Still others, called *pathogens*, cause disease.

The bacteria normally found on your skin are what we call *resident bacteria*. They exist on the skin of normal, healthy people, and are usually not harmful. They're always there, and can't be removed completely.

Other bacteria are transferred to your skin in one way or another. Let's call these *transient bacteria*. Think for a moment about how many ways your hands have picked up bacteria today. Your hands do all sorts of things for you. They write, pick up the telephone, handle money, fix meals and treat wounds. Your hands gather bacteria with each job they do. But, you can remove many of these bacteria by washing your hands and scrubbing under your fingernails.

We can't see individual bacteria without using a microscope. But if they are allowed to grow and multiply on *agar*, we can see them. *Nutrient agar* is a special food used to grow bacteria in the laboratory. It contains everything bacteria need to grow and reproduce.

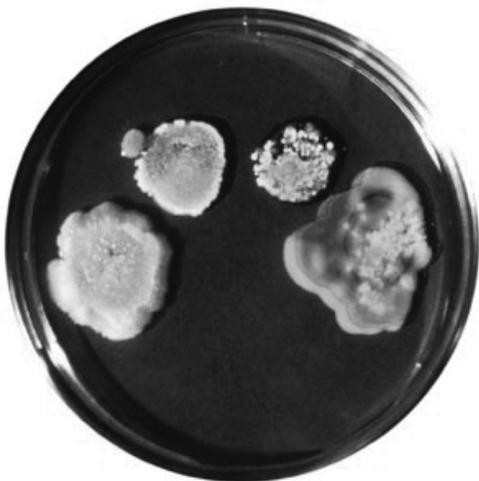
If we transfer bacteria to an agar plate and keep it warm (*incubate* it), the bacteria will reproduce rapidly. There will be so many that we can see them with the naked eye. These millions of bacteria, side by side, are called a *colony*.

Hands



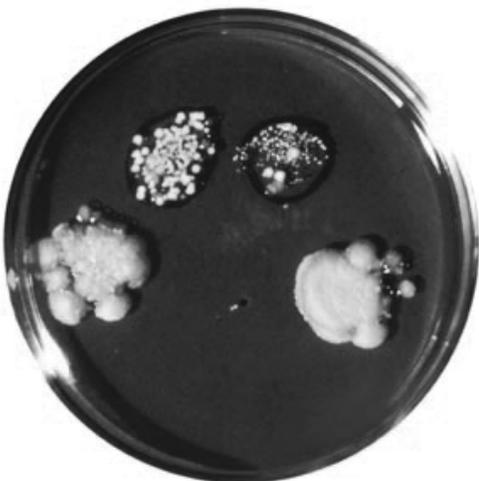
Dirty fingers touch agar

We did an experiment to see how many bacteria were on a person's hands before and after washing them. First, we transferred bacteria to agar plates by touching them with dirty fingers. Then we rinsed the fingers in cold water for 20 seconds. Next, we washed them with soap and water for 20 seconds. After that, we washed the fingers for an additional 20 seconds. Finally, we dipped the fingers in a sanitizing solution containing *chlorine*. (We could have obtained similar results with a *bromine* or *iodine* solution.) We touched the fingers to an agar plate after each cleansing. The plates were incubated at 98°F for 24 hours. These photos show what happened at each step of the experiment.



Unwashed fingers after 24 hours

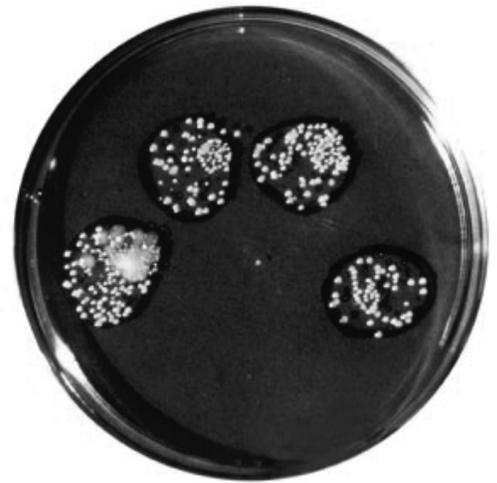
The dirty, unwashed fingers contained so many bacteria that the areas they touched on the agar plate were a mass of colonies.



After 20-second cold-water rinse

The 20-second cold-water rinse removed large particles of dirt and some bacteria, but millions of bacteria were left. As you can see, rinsing your hands with cold water is not a very good way to clean them.

Washing the hands with soap and water for 20 seconds reduced the number of bacteria, but it was not long enough to kill them all.



Fingertips after a 20-second wash with soap and water

After the hands were washed with soap and water for another 20 seconds, the number of bacteria decreased even more.

These photos show that washing your hands with soap and water for at least 40 seconds will reduce the number of bacteria on your hands. Washing them for a full minute works even better. Even though removing all bacteria is impossible with soap and water alone, the important thing is to reduce the number of transient bacteria on your hands. Always be sure to wash your hands thoroughly for at least 40 seconds before you handle food.

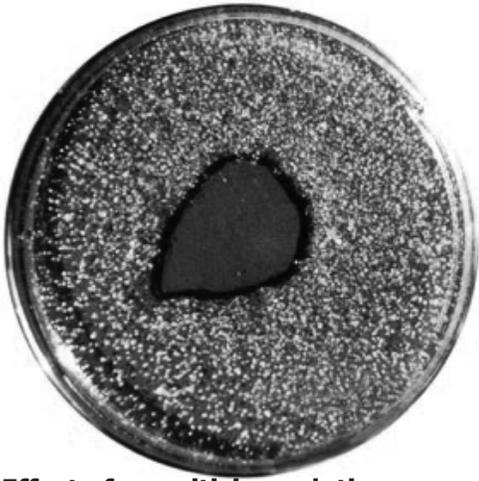


Fingertips after an additional 20-second wash with soap and water

No bacteria grew on the agar plate after the fingers were dipped in a sanitizing solution. The bacteria may or may not have been killed, but the sanitizer stopped their growth. Of course, some people may not be able to use a sanitizing solution because it may irritate their skin.



Fingertips after using a sanitizing solution

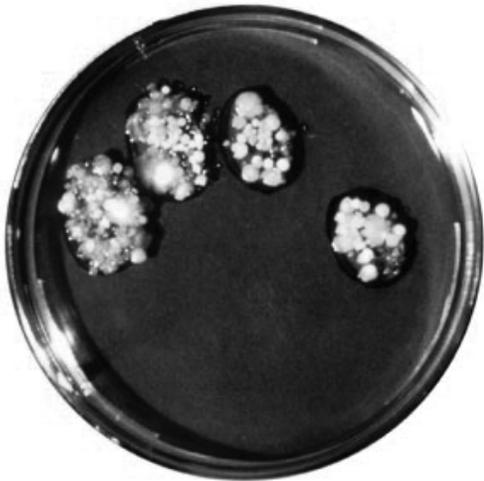


Effect of a sanitizing solution on sneeze germs

This photo illustrates the effect of sanitizing agents on bacteria. An agar plate was sneezed on, and then a drop of sanitizing solution was put in the center of the plate. Bacteria grew in the area not touched by the sanitizer.

This experiment shows the importance of covering your mouth and nose when you sneeze. Your mouth, nose, and throat contain millions of bacteria all the time. Unless you cover your mouth and nose when you sneeze, you spray bacteria around like a spray can.

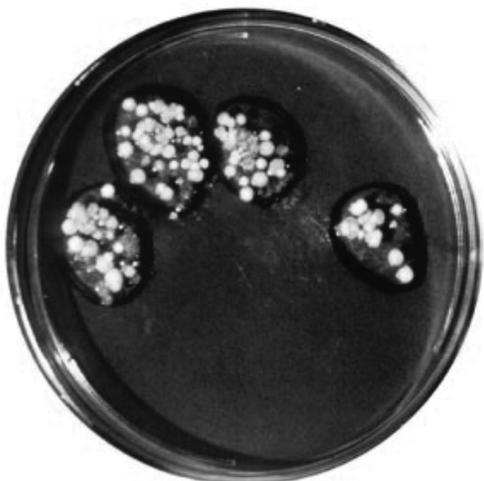
Gloves



Unwashed gloves after 24 hours

Like your hands, gloves also can become dirty and covered with bacteria. In the next demonstration, a person wearing a dirty glove touched an agar plate. He then rinsed the glove in cold water for 20 seconds; washed it with soap and water for 20 seconds; then washed it again with soap and water for an additional 20 seconds; and finally dipped it into a sanitizing solution. After each cleansing, he touched an agar plate. These photographs show how the plates looked after 24 hours.

The dirty glove contained many bacteria, as shown by the large number of colonies left on the agar.



Gloves after a 20-second cold-water rinse

The number of colonies decreased after rinsing the glove in water.

The two 20-second washes with soap and water reduced the number of bacteria to a very low level. Washing with soap and water is better than a plain water rinse for removing bacteria from gloves.



Gloves after a 20-second wash with soap and water



Gloves after an additional 20-second wash with soap and water

The sanitizing solution stopped all bacteria growth.

It was easier to remove bacteria from the gloves than it was from the hands because gloves have no resident bacteria, and have no ridges or crevices in which bacteria can hide. It is possible to remove all bacteria from gloves, even though we can't remove all of them from our hands.



Gloves after using sanitizing solution

Other Sources



Human hair after 24 hours

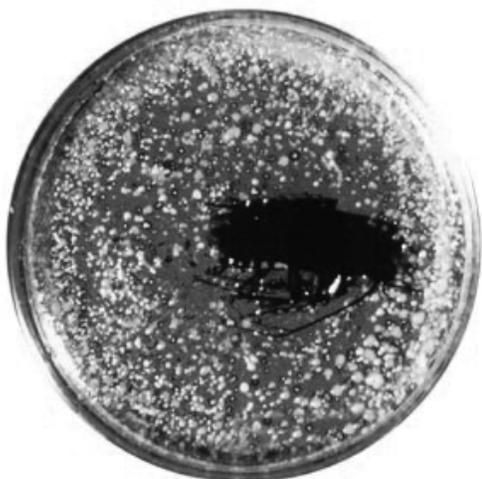
Well-kept hair is attractive, but it should stay out of our food. Nobody likes to see hair in what they are about to eat. It's a good sign that someone didn't follow sanitation rules when the food was processed or prepared. Because it is impossible to completely remove bacteria from your hair, even when you have just washed it, you should always wear a hair net or a hat when you work with food. To demonstrate the importance of this, we placed human hair on an agar plate and incubated it for 24 hours. Look at the number of bacteria that grew around the hair.



A dirty apron after 24 hours

You can also transfer bacteria from dirty aprons and cooking surfaces to food. We touched a dirty apron to an agar plate and incubated it for 24 hours. The bacteria in the photo could easily have been transferred to food. This points out the need for wearing clean clothes and clean aprons every day. If your clothes or apron get dirty during the day, change them.

Cutting boards are another source of bacteria and should be washed thoroughly after each use. Do not use *wooden* cutting boards. Bacteria can hide in the wood fiber, making their complete removal impossible. If you use cutting boards or utensils on raw food, don't use them to hold, serve, prepare or carve *cooked* food until they are thoroughly cleansed and sanitized.



Cockroach after 24 hours

Flies, roaches, rats and other insects leave bacteria on everything they touch, including food, garbage and people. To illustrate this, we let a cockroach walk on an agar plate. This photo shows the number of bacteria the cockroach left on the plate after 24 hours.

We must all work to keep these pests out of our homes, restaurants and food processing plants. The time you spend cleaning and sanitizing your food handling equipment is wasted if you allow insects and rats to walk on them after they've been cleaned. Even the best homes, restaurants and food processing plants have pests from time to time, but they should not be allowed to live in these places for long.

Ashes from tobacco contain very few bacteria, but foreign material of any kind should not be tolerated in food. Do not smoke, and do not allow others to smoke, where food is being processed, stored, prepared or served.

Cuts, bruises and sores on our hands also carry millions of bacteria. If the skin on your hands is broken anywhere, cover the wound completely before handling food.

Bacteria carried on hands may cause food to spoil. They may also cause food poisoning and food infection. As bacteria increase, food develops an odd smell or taste when it is cooked. It

just doesn't taste as good as it should. If bacteria continue to multiply, uncooked food develops a peculiar smell. As the bacteria develop further, the food becomes slimy and slippery to the touch, like a bar of wet soap.

If you handle or start to eat food with a bad smell, taste or feel, throw it away. Never taste food to see if it's spoiled – it may be.

Bacteria are everywhere and on everything, so we have to learn to live with them. But we must try to keep the number of bacteria in our food as low as possible. We can do this by following the simple rules below.

Keeping Food Safe

1. Keep food-handling areas spotlessly clean.
2. Wash your hands often with soap and water. Be sure to wash them thoroughly after using the restroom, dressing a wound and before handling any food. This will help get rid of transient bacteria that can cause disease.
3. Don't handle food if your hands have cuts, bruises or sores.
4. Don't sneeze or cough on food or in areas where food is being prepared.
5. Keep your body and clothes clean.
6. Wear a hair net or a hat when handling food.
7. Keep rats, cockroaches, flies and other insects out of areas where food is processed, stored, prepared or served.
8. Don't use wooden cutting boards — they can't be cleaned properly.
9. Sanitize cutting tools used on raw food before using them on cooked food.
10. Don't smoke – and don't allow anyone else to smoke – in areas where food is processed, stored, prepared or served.

Three Cs for Wholesome Food: Keep it Clean, Cold and Covered.

For more information, contact the University of Georgia Extension Food Science Outreach Program
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Bulletin 693 / Reviewed March 2010



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